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Management and in Hospital Mortality of Upper Gastrointestinal Bleeding Kilimanjaro Christian Medical Center Hospital, Moshi, Tanzania 2023-2024

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Additional Declarations:
No competing interests reported.

Statement on Participation Consent: We have conducted a retrospective study on patients admitted with upper gastrointestinal bleeding at Kilimanjaro Christian Medical Center (KCMC) between January 2023

to December 2024, who met the predefined inclusion criteria. Authorization to access patient records and conduct data collection was granted by the KCMC Institutional Review Board. Due to the retrospective nature of the study and the use of existing patient records, the requirement to obtain individual informed consent was waived by the KCMC Ethics Committee. All data collection procedures were conducted in accordance with the applicable institutional ethical requirements and guidelines for research involving human participants.

Management and in Hospital Mortality of Upper Gastrointestinal Bleeding Kilimanjaro Christian Medical Center Hospital, Moshi, Tanzania 2023-2024

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Abstract

Introduction: Upper Gastrointestinal bleeding (UGIB) is a global health priority due to its high mortality and morbidity. This study assessed the management and in hospital mortality of patients presenting with upper gastrointestinal bleeding at the Kilimanjaro Christian Medical Centre Hospital, 2023-2024. **Methods**: A retrospective facility based descriptive cross-sectional study was implemented on a sample of 217 patients selected through a purposive sampling technique. The data were collected from Kiliminjaro Christan Medical Centre through a standardized pre-tested questionnaire developed by the researcher. The data were computerized through Epi Info7, managed and analysed using SPSS 23, and summarized numerically and graphically. Chi-square tests and ANOVA were performed to assess the association between variables. All statistical tests were considered significant when the $p<0.05$. **Results:** The patients were aged 19-97 years with a mean age of 52.8 years (95% [CI: 50.3-55.3], n=208). The predominate type of UGIB recorded was Variceal bleeding followed by non variceal bleeding with respectively (46.5%, 101/217) and (31.8%, 69/217). Esophagogastroduodenoscopy was performed in all patient (n=217), more than half of the patient had esophageal varicies (57.1%, n=124) followed by duodenal ulcers (15.2%) and portal gastropathy (13.8%). The in-hospital mortality was 20.7%. Among the UGB types, variceal bleeding was arrhythmically associated with death accounting for 44.0% of deaths. **Conclusion:** This study identified the main etiologies of UGIB in Northern Tanzania, with portal hypertensive causes accounting for the majority of cases. These findings are critical in helping inform decision by the Federal Ministry of Health, the health professionals, affected communities and the development partners in order to update management protocols and guidelines for the prevention of early mortality and treatment of UGIB in Tanzania.

Keywords: Africa, Endoscopy, Peptic ulcer, Tanzania, Upper gastrointestinal bleeding, Variceal.

Introduction

Upper Gastrointestinal bleeding (UGIB) remains a major cause of global morbidity and mortality. It is defined as bleeding proximal to the ligament of Treitz presenting as hematemesis, melena, or hematochezia [1,2]. Global incidence ranges from 15 to 172 per 100 000 person-years, with two-thirds clustering between 50 to 120 [3]. It is the most common GI emergency in the United States (approximately 300,000 admissions/year, 5% mortality) [4] and causes over 50,000 admissions and 9,000 deaths annually in the UK [5,6]. The burden in East Africa is substantial. Uganda reports a 20.3% prevalence with 16.7% mortality [7], while a Tanzanian cohort study found 24-hour and 7-day mortality of 34.8% and 18.7%, respectively [4]. Variceal bleeding is also common at the Kilimanjaro Christian Medical Center (KCMC) [8].

UGIB is classified as variceal (VUGIB), a manifestation of portal hypertension caused by various etiologies, including schistosomiasis, portal vein thrombosis, Budd-Chiari, or Gaucher disease. Non-variceal UGIB (NVUGIB) arises from mucosal lesions such as peptic ulcers, esophagitis, Mallory-Weiss tears, gastritis, Dieulafoy lesions, arteriovenous malformations, and malignancy [4]. Endoscopy remains pivotal to providing a diagnosis and assessing the severity and risk of rebleeding of a lesion; for example, peptic ulcers are graded using the Forrest classification, while esophageal varices are stratified by size, traditionally graded I–IV, though the Baveno VII consensus now favours a simplified “small” versus “large” grouping to guide management [2,9–12]

Variceal bleeding occurs in the context of portal hypertension (HVPG >5 mmHg, clinically significant >10 mmHg), classified as prehepatic, hepatic, or post-hepatic according to its various etiologies [9,10]. Esophageal varices account for 51.3% of UGIB in northern Tanzania [2]. Schistosomiasis-related variceal bleeding has been identified by Tamarozzi F et al [16] as the most dangerous complication of the disease in endemic settings like Tanzania, where reported prevalence ranges from 12.8–87.6% [17]. NVUGIB is the most common global cause of UGIB, accounting for approximately 70% of all cases, with an incidence of 84–100/100,000 and mortality of 3–10%. It is predominantly due to peptic ulcers (40–50%), followed by esophagitis, Mallory-Weiss tears, gastritis, Dieulafoy lesions, AVMs, and malignancy [11,12,13]. Risk factors identified in the literature include prior UGIB (relative risk [RR]=13.5), anticoagulant use (RR=12.7), use of high-dose NSAIDs (RR=5.8), and older age (RR=5.6) [14]. Syahridho MA et al. further reported smoking, alcohol, and drug use (NSAIDs, antiplatelets, anticoagulants, SSRIs) as high-risk factors [15].

Clinical presentation varies by the lesion and volume of acute blood loss, ranging from sole epigastric pain and dyspepsia with melena to hematemesis and coffee-ground emesis, and, in cases of significant hemorrhage, syncope [7]. Tanzanian data assessing both historical (symptom) and physical examination findings have identified tachycardia as the leading finding (45.5%), followed by combined hematemesis/melena (31.7%) [4], while Jaka et al. found isolated hematemesis to be the dominant symptom (80.4%) [2].

Upper endoscopy (EGD) remains the diagnostic gold standard. Current guidelines recommend it be performed within 24 hours of presentation for suspected non-variceal UGIB [21-23]. However, more recent evidence indicates that a 12-hour window is not required even for a presumed portal-hypertensive etiology, and that endoscopy within 24 hours is sufficient regardless of suspected cause; a finding particularly relevant where endoscopic resources are limited [24]

Management of variceal bleeding centers on resuscitation and early initiation of vasoactive agents, such as terlipressin, together with antibiotic prophylaxis, and endoscopic therapy in the form of variceal ligation (EVL) or sclerotherapy (EIS). Trans jugular intrahepatic portosystemic shunt (TIPS) is not recommended as routine first-line therapy but may be considered early in selected high-risk patients, or as rescue therapy for recurrent or refractory bleeding, where available [7,19]. M. Mwachiro et al., in a sub-Saharan African survey, found esophagogastroduodenoscopy (EGD) to be available in 70% of centers, with variceal band ligation the leading intervention (52.9%), followed by dilatation, injection therapy, and clipping [20]. NVUGIB management includes appropriate risk stratification and resuscitation; transfusion to a hemoglobin target of 7–9 g/dL; endoscopic hemostasis for Mallory-Weiss and Dieulafoy lesions; H. pylori eradication; biopsy of suspicious ulcers; endoscopic hemostasis for high-risk lesions followed by high-dose PPI, which decreases rebleeding and mortality; trans arterial embolization; and newer tools such as hemostatic powder spray and over-the-scope clips for refractory bleeding [13,19].

Despite the substantial global and regional burden of UGIB, including its high incidence, alarming 24-hour mortality (34.8%), and status as a leading GI emergency [3–7], Tanzania lacks published data quantifying its management and outcomes; existing local data, including from KCMC, are limited to prevalence and mortality figures rather than management practices or clinical outcomes. In this context, this study explores the management and outcomes of UGIB at Kilimanjaro Christian Medical Center and contributes to informing potential evidence-based improvements to local management guidelines and mortality reduction efforts.

Methods

Study design

A retrospective, facility-based, cross-sectional study was implemented in Kilimanjaro Christian Medical Center Hospital (KCMC), Moshi, Tanzania.

Study area and population

The United Republic of Tanzania is in East Africa with a total area of 945,087 km2 including 61,000 km2 of inland water. It has international borders with Uganda, Kenya, Rwanda, Burundi, Democratic republic of Congo (DRC), Zambia, Malawi and Mozambique [14]. The interpolation of the latest United Nations data on January 5th 2025 revealed that the population of Tanzania is 69,574,477 with a growth rate of 2.846% [15]. The females to male ratio in 2024 was 98.283 males per 100 females [16]. The Government of the United Republic of Tanzania is composed of 30 administrative regions; 25 regions on the mainland and 5 in Zanzibar. The study was implemented in Kilimanjaro, which lies on the mainland in Tanzania - a home for 1,861,934 with a growth rate of 1.3%. Kilimanjaro has six districts (Hai, Moshi rural, Mwanga, Rombo, Same, Siha districts) and the Moshi rural municipality [17]. Tanzania has four main referral hospitals located in different zones to serve as tertiary referral hospitals. These include the Kilimanjaro Christian Medical Centre (KCMC) in the Northern zone, the Mbeya Referral Hospital (MRH) in the Southern highlands zone, the Bugando Medical Centre (BMC) in the Western zone, and the Muhimbili National Hospital (MNH) which serves the coastal zone. This study was conducted at the Kilimanjaro Christian Medical Centre (KCMC), a referral and teaching hospital established in 1971, with a total bed capacity of 540, that includes 14 beds in the ICU and 4 ventilators (ratio of hospital beds to ICU beds is 80:1). The ratio of physicians to patients in KCMC is 1:14 [18].

Sampling size and technique

A purposive sampling technique was used to include Kilimanjaro Christian Medical Centre Hospital as it is the main tertiary referral hospital along the Northern zone of Tanzania. A sample of 217 patients were obtained during the study period. Patients whom their final diagnosis in the record were labelled as UGIB admitted from January 2023- to December 2024, above 18 years old, irrespective of their gender, were included in the study. Patients hospitalized for other gastrointestinal diseases, unconfirmed diagnosis of UGIB conditions, or those who were

lost before reaching the hospital were excluded from the study. A sample size of 217 patients fulfilling the inclusion criteria were obtained and included in the study.

Data collection and analysis

The data were collected from the hospital medical records using a standardized pretested data collection tool developed by the researcher in English. The data collected were the characteristics of the participants (age, gender, toxic habits, profession, residence), Final diagnosis, labrotary investigation, endoscopic findings along with the management received. The data collection tool was designed in Epi-info 7, a free software developed by CDC Atlanta, to facilitate data entry. Then the data was managed and packaged using SPSS 23. The data were summarized numerically using mean, standard deviation and median, depending on the distribution, and graphically in the form of frequency tables and graphs. Associations between variables were assessed through Chi-square tests or ANOVA, where appropriate. All statistical tests were considered significant with *p*-value of < 0.05.

Results

Characteristics of the participants

A total of 217 patients were enrolled. The patients were aged between 19 to 97 years with a mean age of 52.8 years (n=208). More than half were aged between 31-54 years (38.5%, 80/208) followed by 18.3% (38/208) aged 55-65 years. Males were mostly affected followed by females with respectively (57.6%, 125/217) and (42.4%, 92/217). The length of hospital stay ranged from 1 to 73 days with a median of 5 days. The average length of hospital stays varied by gender, it was lower in males (mean= 7 days, 95% [CI:5.4-8.6], n=94) than females (mean= 8.2 days, 95% [CI: 5.5-10.8], n=79), however this difference was not statistically significant ($F_{1,171}$=0.584, p=0.446). The two predominant marital status was married (73.2%, 156/217) and single (14.1%, 30/217). Among the patients, more than half had substance abuse (50.3%, 98/196), predominantly Alcohol (33.3%, 65/195). Chronic diseases were evident across 47.9% (113/217) with the majority (39.4%, 41/104) had multisystem disease followed by Abdominal diseases (26.9%, 28/104) as displayed in table 1.

Table 1: Characteristics of the participants (n=217).

Variable	NB*	%	Variable	NB*	%
Age years (n=208)			**Substance Abuse (n=195)**		
Mean	52.8		No Substance Abuse	97	49.7
Min-Max	19-97		Alcohol	65	33.3
18-30 years	33	15.9	Alcohol & Smoking	22	11.3
31-54 years	80	38.5	Smoking	10	5.1
55-65 years	38	18.3	Snuffing	1	0.5
66-97 years	57	27.4	**Chronic diseases (n=104)**		
Gender (n=217)			Multisystem disease	41	39.4
Male	125	57.6	Abdominal disease	28	26.9
Female	92	42.4	Cardiovascular disease	20	19.2
LOS* (n=173)			Endocrine disorder	7	6.7
Median	5		Tumors	5	4.8
Min-Max	Jan-73		Mental disorder	2	1.9
Marital status (n=217)			Renal disease	1	1
Married	156	73.2			
Single	30	14.1			
Widowed	19	8.9			
Divorced	8	3.8			
Occupation (n=209)					
No Job	21	10			
Cultivator	102	48.8			
Self Employed	44	21.1			
Employee	29	13.9			
Student	8	3.8			
Armed force	5	2.4			

*NB:Number of cases. *LOS: Length of hospital stay.

Types of Upper gastrointestinal bleeding.

The prevalent type of UGIB was Variceal bleeding (46.5%, 101/217) followed by non-variceal and combined UGIB with respectively (31.8%, 69/217) and (21.7%, 47/217). All categories of UGIB, were predominant among patient above 50 years, namely, Non variceal (mean=52.2years, 95% [CI: 48.0-56.4], n=67), Variceal UGIB (mean=52.9years, 95%[CI: 49.1-56.8], n=97) and Combined UGIB (mean=53.5years, 95%[CI: 48.1-58.8], n=44). No statistically significant association was found between the age and the types of UGIB ($F_{2,205}$=0.67, p=0.937). More than half (65.2%, 45/69) of Non varicieal were male where as 34.8% (24/69) were female. Similarly, Combined and Varcieal UGIB prevailed across male with respectively (55.3%, 26/47) and (54.5%, 54/101). However, No statistical significant association between the types of UGIB and gender (p=0.294).

Table 2: Types of UGIB by Gender (n=217).

	Gender					
UGIB types	**Male**	**%**	**Female**	**%**	**Total**	**%**
Variceal	54	53.5	47	46.5	101	46.5
Non variceal	45	65.2	24	34.8	69	31.8
Combined	26	55.3	21	44.7	47	21.7
Total	125	57.6	92	42.4	217	100.0

Laboratory investigations

Hemoglobin levels among UGIB patients

More than half (86.6%, 188/217) of the patients were anemic. The hemoglobin values range from 2 to 17 g/dl, mean= 7.6g/dl. All UGIB types had primarily Hb levels < 8g/dl ranking from the lowest is combined UGIB (mean= 6.8 g/dl, 95% [CI:5.9-7.7], n=47), followed by non-variceal (mean= 7.8 g/dl, 95% [CI:6.9-8.6], n=69) and Variceal (mean= 7.9 g/dl, 95% [CI:7.2-8.5], n=101). No statistically significant association between the Hb levels and types of UGIB ($F_{2,214}=1.69$, $p=0.186$).

Bleeding profile of UGIB patients

The bleeding profile of the patients were assessed through the measurement of the Prothrombin time (PT), activated Partial thromboplastin time (aPTT) and the International normalized ratio (INR). The PT ranges from 9 to 47 seconds with a median=12.15 seconds. More than half (52.9%, 82/155) had prolonged PT, while 38.7% (60/155) had normal PT ranges and delayed PT accounts for 8.4% (13/155). Among the UGIB types, prolonged PT prevailed in Variceal (54.7%, 41/75) as whereas delayed PT prevailed in combined UGIB (Supplement S1). No statistically significant association was found between the PT and the types of UGIB ($p=0.95$). In view of the aPTT, it ranged from 18 to 88 seconds (median=27.09 second). The majority of the patient (46.5%, 46/99) had delayed aPTT followed by normal and prolonged aPTT with respectively (37.4%, 37/99) and (16.2%,16/99). Among patients with delayed aPTT, more than half had varicieal bleeding (52.2%, 24/46) followed by combined and non-varicieal with respectively (28.3%, 13/46) and (19.6%, 9/46). Furthermore, among patients with normal aPTT, the majority (54.1%, 20/37) had varicieal bleeding followed by Non variceal bleeding (27.0%, 10/37). On the other hand, more than half of the patients with prolonged aPTT had varicieal followed by combined UGIB with respectively (68.8%, 11/16) and (25.0%, 4/16) (Supplement S2). No statistical significant association was

found between the types of UGIB and PT (p=0.341). In view of the INR, it was recorded in 152 patients, it ranges from 1 to 4 (mean=1.29). More than half (90.8%, 138/152) had low INR where as normal and high INR accounts for the minority with respectively (6.6%, 10/152) and (2.6%, 4/152).

Liver profile findings among UGIB patients.

The liver profile was assessed through the measurement of the liver enzymes and albumin, it was further classified into three categories namely normal, reduced liver synthetic function (albumin drop) and aminotransferase elevation (one or both liver enzymes raised). More than half of the patients (56.3%, 99/176) had a normal liver profile followed by liver injury in 34.7% (61/176) and reduce liver synthetic function in 9.1% (16/176). Normal liver profile prevailed among combined (58.3%, 21/36) and Variceal bleeding (57.1%, 48/84) than non-variceal (53.6%, 30/56). Furethermore, Liver injury prevailed among non-variceal patients (39.3%, 22/56) than combined and Variceal UGIB patient with respectively (33.3%, 12/36) and (32.1%, 27/84). Reduce liver synthetic function prevaile among varicieal bleeding (10.7%, 9/84). However no statistically significant association between the UGIB types and the liver profile (p=0.890) (As displayed in supplement S3)

Endoscopy findings

Esophagogastroduodenoscopy (OGD) was performed on all patients (n=217), Table 6 displays the findings in the esophagus, stomach and duodenum. During exploration of the esophagus the predominant finding was varices (57.1%,124/148). The varices grade was recorded on 92 patients, among them grade 3 was the predomiant category accounting for 45.7% (42/92) followed by grade 4 (40.2%, 37/92), grade 1 (9.85, 9/92) and grade 2 (4.3%, 41/92). Furthermore, esophageal varices & esophagitis ranks second accounting for 4.7% (7/148) as displayed in table 6. Overall, 41.0% (89/127) had a gastric pathology that included a portal gastropathy (33.7%, 30/89), features of gastritis (31.5%, 28/89), and gastric ulcer (14.6%,13/89). Duodenal lesions were noted in 19.4% (42/217). More than half (78.6%, 33/42) of these were duodenitis (19.0%, 8/42), followed by a combination of duodenal ulcer and duodenitis (2.4%, 1/42).

228 **Table 3: Endoscopic findings among UGIB patients**

Variable	Nb*	%
Esophageal Finding (n=148)		
Esophageal Varices	125	84.4
Esophageal varices & Esophagitis	7	4.7
Esophagitis	6	4.1
Esophageal varices & Ulcer	2	1.4
Esophageal ulcer	2	1.4
Mallory Weiss tear	2	1.4
Esophageal varices & Mass	1	0.7
Ulcerative mass	1	0.7
Esophagitis &Mallory Weiss	1	0.7
Esophagitis & Esophageal ulcer	1	0.7
Gastric findings (n=89)		
Portal gastropathy	30	33.7
Gastritis	28	31.5
Gastric ulcer	13	14.6
Gastric mass	9	10.1
Gastritis& ulcer	3	3.4
Portal gastropathy Gastric varices& gastritis	1	1.1
Portal gastropathy & Gastritis	1	1.1
Gastric varices & Gastritis	1	1.1
Gastric varices & portal gastropathy	1	1.1
Gastric mass &ulcer	1	1.1
Portal gastropathy & gastric mass	1	1.1
Duodenal findings (n=42)		
Duodenal ulcer	33	78.6
Duodenitis	8	19.0
Duodenal ulcer & Duodenitis	1	2.4

229 *NB: Number findings

230 ***Medical management of UGIB patients***

231 The majority of patients (92.6%, 201/217) were administered medications during their hospitalization.
232 Medication was grouped into two categories: symptomatic and supportive. In regard to symptomatic
233 management, proton pump inhibitors (PPI) were the predominant drug administered (31.3%, 68/217), followed
234 by PPIs and antibiotics (28.1%,61/217), and PPIs and octreotide (10.1%, 22/217) (figure 1).

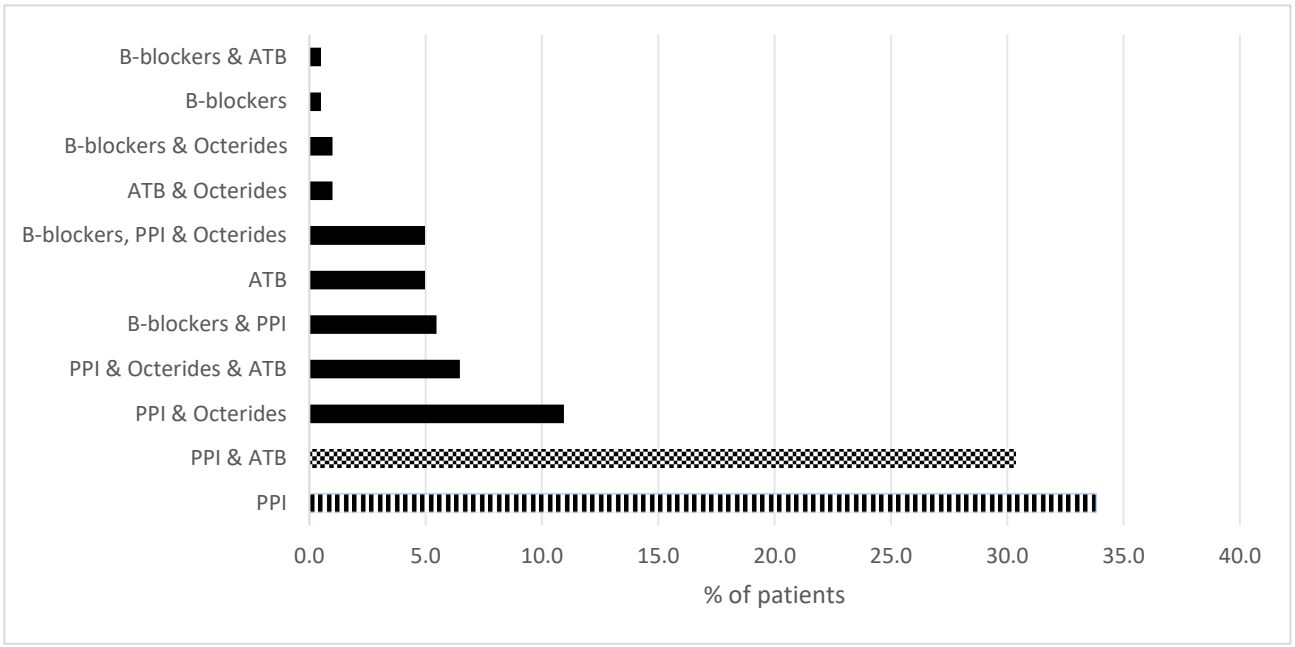


Figure 1: Symptomatic management of UGIB patients (n=201).

Supportive medications were administered in 19.3% (43/217),, with the predominant medication being iron supplementation (25.6%, 11/43) followed by folic acid (20.9%, 9/43) and tranexamic acid (18.6%, 8/43) (figure 2).

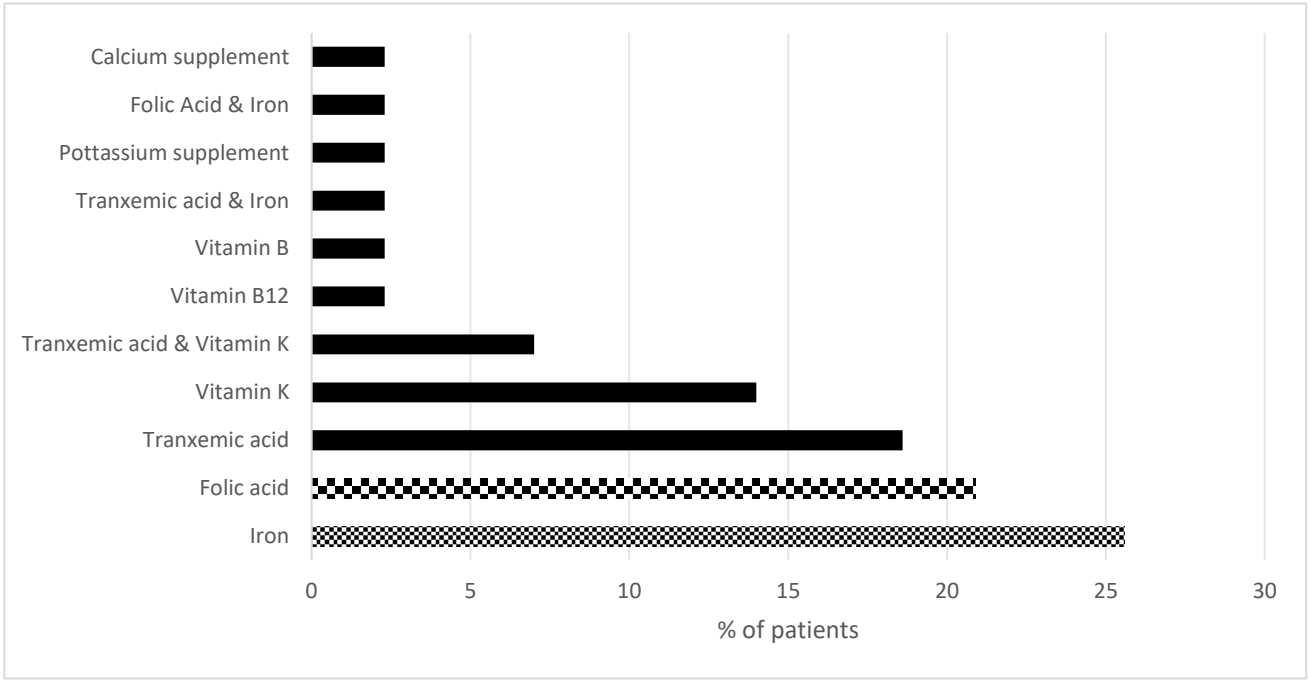


Figure 2: Supportive management administered to UGIB patients (n=43).

Endoscopic management of UGIB patients

Overall, 41.0% (89/217) of patients underwent endoscopic hemostasis. More than half (60.7%, 54/89) had injection therapy alone, followed by a combination of injection therapy and band ligation (34.8%, 31/89), and band ligation alone (4.5%, 4/89). Patients undergone injection therapy (n=85) had predominantly variceal bleeding (44.7%, 38/85) followed by non variceal and combined UGIB (36.5%, 31/85) and (18.8%, 16/85). No statistically significant association was found (p=0.78). Among patient undergone band ligation (n=53), more than half (60.0%, 21/53) had variceal bleeding followed by combined UGIB (23.0%, 8/53) and Non variceal bleeding (17.0%, 6/53). A statistically significant association was found between the band ligation therapy and types of UGIB (p=0.04).

In hospital mortality and cause of death

More than half of patients (79.3%, 172/217) survived the acute event and were discharged. The in-hospital mortality was 20.7% (45/217). There was no statistically significant association (p=0.146) linking age to mortality (deceased mean=49.20 years, 95%[CI:43.7-54.7], n=44) vs (alive mean= 53.8 years, 95%[CI:51.0-56.6], n=164). Variceal bleeding was arrhythmically more often associated with death (44.0%, 20/45) followed by non-variceal (33.0%, 15/45) and combined UGIB (22.0%, 10/45), but the differences were not statistically significant p=0.95). Deceased patients had a non-significant (p=0.154) shorter length of hospital stay (Mean= 5.4 days, 95% [3.9-6.9], n=36) compared to patients discharged alive (mean= 8.07 days, 95%[CI: 6.3-9.9], n=138). The predominant cause of death was hypovolemic shock (55.6%, 25/45) followed by a combination of aspiration and pulmonary edema (13.3%, 6/45), hepatic encephalopathy (11.1%, 5/45), as well as sepsis and edema and multiorgan failure (each accounting for (8.9%, 4/45), followed by severe anemia (2.2%,1/45).

Discussion

This study analyzed the management and outcomes of UGIB at the Kilimanjaro Christian Medical Centre in a sample of 217 inpatients enrolled from 2023 to 2024. The patients were aged between 19 and 97 years, with a mean age of 52.8 years. The predominant age group in this study was 31-54 years (38.5%, 80/208), reflecting that middle-aged patients were primarily affected. This vulnerability has been similarly documented by Jaka et al. [2], who reported an average age of 45 years in UGIB patients, and Opio et al. [7], who documented a mean

age of 45.7 years. The UGIB cases were predominantly male (57.6%, 125/217), consistent with Saydam et al. [3], who reported a male proportion between 55-65%, and Opio et al. [20], who documented a male proportion of 62% in northern Uganda.

We grouped the population into three categories of lesions causing UGIB in this study, namely variceal, non-variceal, and a group with combined. Variceal bleeding was the predominant category, accounting for 46.5% (101/217), followed by non-variceal bleeding 31.8% (69/217). This finding is consistent with research conducted in Tanzania and the broader East. Jaka et al. [2] reported in a study at Bugando Medical Centre in northwestern Tanzania that variceal bleeding was the leading cause of UGIB, accounting for 54.2% (130/240). By contrast, Wasserman et al. [11] noted a predominance of non-variceal bleeding in high-income countries, a difference likely reflecting the higher regional burden of chronic liver disease and portal hypertension, especially due to schistosomiasis, in East Africa relative to settings where peptic ulcer disease and NSAID/anticoagulant use are more common precipitants. Kaplan et al. [9] further noted that in liver disease-endemic regions, demographic factors such as age and gender may have limited value in predicting a bleeding aetiology, consistent with the findings of our study.

Laboratory findings revealed a high prevalence of anemia (86.6%, 188/217), with combined bleeding patients presenting with the lowest mean hemoglobin (6.8 g/dl, 95% [CI: 5.9-7.7], n=47). Kate et al. [13] documented an opposite pattern, where severe anemia was reported in variceal hemorrhage, attributing this to the extent of blood loss characteristic of variceal rupture.

Esophageal varices were the predominant finding (84.4%, 125/148) among documented esophageal findings, with portal gastropathy observed in roughly a third (33.7%, 30/89) of noted gastric anomalies. Jaka et al. [2] similarly reported esophageal varices in 56% of UGIB patients, while Nziku et al. [8] found portal gastropathy in 35% of cases, closely mirroring the rates observed here. The significant association between UGIB type and endoscopic intervention ($p = 0.04$), with band ligation reserved almost exclusively for variceal bleeding and injection therapy more evenly distributed across types, aligns with best-practice guidelines described by Orpen-Palmer and Stanley [1] and Wasserman et al. [11]. This pattern suggests that, despite resource constraints, endoscopic decision-making at this centre broadly follows internationally recommended, aetiology-targeted approaches. These findings are reassuring for a management-focused study; however, the specific timing of

endoscopy relative to admission and use of injection of epinephrine alone for bleeding was not captured in this dataset and represents an important area for future audit.

The in-hospital mortality rate of 20.7% (45/217) corresponds closely with that of Rajan et al. [4], which was 22% in Tanzanian tertiary hospitals and the 19% figure from Opio et al. [7] in Uganda, suggesting that outcomes at this centre are broadly comparable to others in the region. Hypovolemic shock was the leading cause of death (55.6%), consistent with the regional burden of severe bleeding complications. The lack of significant mortality differences according to age, UGIB type, or length of stay is in agreement with Hearnshaw et al. [5] and Campbell et al. [6], who noted that survival in UGIB is multifactorial and associated with comorbidities, timeliness of care, and healthcare access rather than any single demographic or clinical variable in isolation. Notably, deceased patients had a shorter length of hospital stay than survivors, which likely reflects early mortality among the most severely ill patients rather than the effect of shorter admission.

Limitations

This study has several limitations that should be considered when interpreting its findings. The retrospective, single-centre design limits causal inference between the management strategies employed and the outcomes observed and restricts generalizability to other settings with different resource levels or patient populations. The incomplete medical records resulted in substantial variation in the denominators available for different variables (ranging from n=217 down to n=15 for some endoscopic and laboratory findings), which reduced statistical power for several subgroup comparisons. Therefore, the number of non-significant associations reported in this study should be interpreted with caution, as they may reflect limited power rather than a true absence of association.

Furthermore, the time from admission to endoscopic intervention was not captured, despite being one of the most consistently cited modifiable predictors of outcome in UGIB; future work at this centre should prioritize capturing this variable. Despite these limitations, this study benefits from a relatively large single-centre cohort and comprehensive endoscopic characterization across all three UGIB

categories, providing a valuable regional benchmark for management and outcomes in a liver-disease-endemic, resource-limited setting.

Additional files

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Table 2: Types of UGIB by Gender (n=217).

Table 3: Endoscopic findings among UGIB patients.

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Figure 2: Supportive management administered to UGIB patients (n=43).

Supplementary files

Supplementary files S1-S2

S-1: Displaying the UGIB types by the Prothrombin time (n=155)

S-2: UGIB types by the activated partial thromboplastin time (n=99)

S-3: UGIB types by the liver profile (n=176).

S-4: Ethical Approval from the KCMC review committee

Declarations

Ethics approval.

The proposal was reviewed by the Review Board of the Faculty of Medicine of the University of Medical Sciences and Technology. Ethical approval was granted by the Review Committee of Kiliminjaro Christian Medical Center (attached your easy reference as supplementary files), whom provided the permission to access to the medical records and facilitate data collection.

Consent for publication

Not applicable

Availability of data and materials

All the data related to this manuscript were included in this manuscript or attached as supplements.

Competing interests

The authors declared no competing interest

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Authors' contributions

M.E: Conceptualization and implementation of the research proposal, data analysis, drafting initial/ final manuscript.

H.W: Co-Supervised the development and implementation of the research, guided in data curation and analysis, fully supported in drafting the initial and the subsequent versions of the manuscript, read and roof read the manuscript prior to submission

A.B: Co-supervise the research proposal development and its implementation, evaluate critically the data analysis findings, read and proof read the initial and final manuscript prior to submission.

H.W: participation in data curation, data analysis read and proof read the final draft of manuscript

A.A: participation in data analysis and proof reading the final manuscript prior to submission

L.E: Read and proof read the initial and final draft of manuscript

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Supplementary Files

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